# Science News-Letter

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EVOLUTION

# Man's Age Now Set at Millions of Years

*PROF. HENRY FAIRFIELD OSBORN, President of the American Museum of Natural History, in New York City, who holds that man is not descended from an ape-like ancestor. Dr. Osborn is the author of "Men of the Old Stone Age," and other works on the prehistory of man.*

By Watson Davis

Whence and when came man? This question, particularly since the time of Darwin, has raised as much controversy and debate as the more unsettled question: Whither goeth man?

Tennessee anti-evolution laws and fundamentalists notwithstanding, scientists today are agreed that man is an animal, that he is a mammal, that his brain and his body are much like those of the rest of the animal world. The roots of man extend into a rich and arduous past and his family tree traced back far enough will show his close kinship to the apes, monkeys, and tree-shrews and other primates and his distant relationship to the rest of the animals. Evolution of man and the rest of the animate world is the most fundamental theory existent in biology today.

Upon such specific questions, however, such as whether man is a mere million or some twenty million years old, whether a primitive anthropoid, called Dryopithecus, was a great, great, ever so great grandfather or merely a distant cousin of the human race, or whether primitive man older than the Indians existed upon the American continent, scientists do differ.

The average person whose only acquaintanceship with gorillas and chimpanzees is through zoo cage bars or the antics of the circus monkeys has a quite understandable repugnance to these animals and is not particularly flattered to learn that they are man's nearest animal relatives. When these anthropoids are studied carefully, psychologists and physiologists find so many similarities between them and man that the conclusion can not help being drawn that tailless apes, including the gorilla and the chimpanzee, are more nearly related to modern man than they are to the tailed monkeys with whom they are usually classed by the ordinary person.

The latest evolution controversy within the ranks of science is between Prof. Henry Fairfield Osborn, president of the American Museum of Natural History and Dr. William King Gregory, of the same institution. Prof. Osborn is author of "Men of the Old Stone Age" and other authoritative books on ancient man and evolution, while Dr. Gregory is one of the leading American anatomists who has devoted himself to the study of man's evolution. Their scientific difference of opinion is marked by close friendly personal relations.

Science must abandon the theory that man descended from an ancestor who was both ape and man. This is the contention of Prof. Osborn. And he believes that man is immensely older than science has hitherto believed. The prologue of the human drama occurred some 16,000,000 years ago in the period of the earth's history that geologists know as the Upper Oligocene. It was at this time that the Dawn Man sprang from a primitive primate stock, which branching in another direction gave rise to the ancestors of the anthropoid apes, the gorillas and chimpanzees of today. The opening act in human evolution, according to Osborn, occurred on the high plateaus and plains of northern Asia, where the dawn man, great, great grand-

*(Just turn the page)*

*DR. WILLIAM KING GREGORY, anatomist of the American Museum of Natural History, in New York City, who differs with Prof. Osborn. He believes that man and the apes sprang from the same stocks not earlier than about 7,000,000 years ago.*

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### Man's Age Extended

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daddy of the present day human races, lived on the ground and used tools skillfully and well. Prof. Osborn reads the apes out of the human family tree, an act that appeals sentimentally to many people. The apes under his theory become remote and distant cousins instead of fairly close relatives.

Dr. Gregory, on the other hand, holds to the older and more generally accepted view that man and the apes had common ancestors as late in the earth's history as 5,000,000 to 7,000,000 years ago. From anatomical studies of brain, teeth and bodily structure of living and fossil men, apes, and other primates, he concludes that the anthropoid apes as a whole are undoubtedly man's nearest known relatives and he lists the primates in order of their relationship to man as: Primitive man, gorrilla, chimpanzee, orang, gibbon, Old World monkey, New World monkey, Tarsius, lemur, pentailed tree-shrew. Moreover Dr. Gregory considers that the primitive anthropoid, Dryopithecus, whose fossil remains have been found in the Siwalik hills in India, is a joint ancestor of the apes and man, a sort of missing link between the two stocks.

### Man's Age From Teeth

Fortunately teeth, which are more readily preserved through the ages than nearly any other part of the skeleton, give the most information about the ancestry of the individual. Prof. Gregory has found that the distinctive pattern of the ape-man ancestor, Dryopithecus, is preserved in the teeth of the primitive Piltdown man whose jaw was found in England. And reasoning statistically he finds that a period of some 800,000 generations of evolution can be allowed as the interval between the Dryopithecus and the

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## News-Letter Features

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# Nature Trails Teach Nature's Lessons

## Coordinating Nature Studies

The material on this page is furnished by the Coordinating Council on Nature Activities.

Realizing the need for a national program that would coordinate the nature activities of national groups working with young people, the American Museum of Natural History invited these volunteer organizations to form a council to be known as the Coordinating Council on Nature Activities for the purpose of teaching the growing generation, through nature activities, the value of all wild life and natural resources and their conservation. The organizations represented are: American Museum of Natural History, American Nature Study Society, Boy Scouts of America, Camp Directors' Association, Camp Fire Girls, Inc., Girl Scouts, Inc., Pioneer Youth of America, Playground and Recreattion Association, and the Woodcraft League of America.

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## Nature Trails

Nature has numerous stories to tell. Many of these stories, however, are lost to the public, out-of-doors, unless some method be devised to call attention to various interesting things that are to be found on every hand. Mere labels upon trees and other plants along the walks and paths are not enough in themselves, although they may succeed in attracting a public that has formerly been somewhat interested in Nature Study. In order to appeal to the growing army of people who seek the open air during the spring and summer months, Nature Trails have been developed in many sections of the country, particularly in the National Parks.

At Bear Mountain, on the Hudson, in the Harriman section of the Palisades Interstate Park, where tens of thousands of people spend their week-ends during the vacation seasons, an experimental Nature Trail is being built. An outdoor nature building is being provided by the Laura Spellman Rockefeller Foundation. At the beginning of this trail is the following label—"How many of us are able to read, unaided, the 'signs' of Nature? Let the guiding labels take the place of a Naturalist Friend who has an interesting story to tell you as you follow the trail." This introductory label really explains the purpose of the project and tells the idea and aim of the series of "signs" following along the path. Attention is called to the various phases of nature, including the principal geological features of the region, the story of the birds, mammals and amphibia. The botanical trail is being developed under the direction of Dr. Clyde Fisher, of the American Museum of Natural History. Dr. Frank E. Lutz, of the same institution, who developed the Nature Trail idea at his station near Tuxedo, is the scientific adviser of the work. The naturalist in charge is William H. Carr also of the American Museum.

The educational work upon the Bear Mountain Trail includes the teaching of conservation. The following label upon a gray birch reads: "This is one of the trees from which the bark used to be peeled BEFORE people learned that it was the wrong thing to do." An attempt is made, throughout, to have the labels include not only the names, but some interesting facts as well. In order to prevent lengthy wording, a series of two or more labels are sometimes used to explain certain facts.

At the National Parks Conference, which was recently held at Bear Mountain, a resolution was accepted to adopt Nature Trails throughout the United States. There is indeed a great future for this new phase of Nature Education.

William H. Carr,
*American Museum of Natural History*

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## An Easy Tree To Nick-Name

The boy with personal peculiarities is generally well known and generally nick-named. That is, he bears an "eke-name" in addition to the John or Samuel given to him by his parents. So it is with several of our common native trees—the Buckeye, the Redbud, the Shagbark, the Tulip Tree. The same is true of the Kentucky Coffee Tree, which was thus nick-named because some of the early settlers south of the Ohio River used its seeds as a substitute for coffee. The name they gave to it, although generally accepted, is not very apt. The hard seeds are indeed like roasted coffee in color, but the bitter drink made from them has little of the taste of our breakfast beverage. Others who named the tree did somewhat better. They noticed that its twigs never bore any fine spray and that each twig when the leaves had fallen looked like the stump of a branch with the end cut off. So these observers named it the Stump Tree. They might have called it the Solitary Stump Tree, for it is a rare tree, fond of growing alone. In 1783 the French botanist, Lamarck, who also noticed that the branches had no spray gave it the Greek name, *Gymnocladus* (naked branch), which it still bears in all the tree books.

Now that we know it better we may want to call it by other names. One who hunts for its winter buds may want to call it the No Bud Tree, for until spring is well advanced its buds appear to be scarcely more than little brown spots set in "silky craters." They look strangely unlike any other buds. One who handles the beautiful seal-brown seeds and tries to cut their adamantine coat may want to name the tree that bore them the Brown Ivory Tree. Perhaps some experimenter waiting more than a whole year for these seeds to germinate may find a name to tell how lazy they are. While observing the tree's solitary habits and the peculiar whiteness of its young bark, which breaks into flakes and peels like the skin of a patient who has had fever, one may be tempted to call it the Leprous Tree. When one cuts a twig and observes the beautiful salmon color of its pith, one feels sure that somewhere the Indians must have had a flowing name which meant, "The tree with the salmon pith." Surely a tree so easily named deserves wider acquaintance.

L. M. Dougan,
*American Nature Study Society.*

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## Hobbies That Count

To uncover the treasure chests of the notorious Captain Kidd is the ambition of every boy who possesses a pick and a shovel and a place to dig. If you tell your scouts who are qualifying for the mining merit badge that they may find genuine jewels and marketable stones, they may regard you with suspicion. Yet nearly every state in the Union has at least one mineral that has value as a gem or which is so rare in other parts of the country that it is earnestly sought by mineral collectors.

The mineral collection offers more than money values, however. It offers hours of pleasure and profit. Hikes become more interesting and

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### Nature Trails

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worth while with minerals as an objective. Minerals give a chance to make a collection which would be a real asset to the camp museum, the school, or the community house. Here also is a splendid opportunity to carry out in principle an individual patrol or even troop project. One of the most popular of such projects, as has again and again been demonstrated, is the collection and preparation of a mineral display.

For instance, the display that won the first prize among the collections at the Mohawk Indian Village at the Eastern States Exposition in 1926 was a mineral collection displayed by Troop 19, East Orange, N. J. This was not merely the group of miscellaneous classified minerals and rocks so often seen, but was a display arranged by the scouts to show how common minerals are related to our everyday life. Beside a piece of crude lead ore was a short length of finished lead pipe. Beside a chunk of silver ore glistened a sterling teaspoon and a few silver coins. Contrasted to the specimen of copper ore lay a coil of copper wire. Mercury made possible the thermometer; mineral talc, a can of talcum powder, etc.

Among the features of a recent annual banquet of Troop 8 of Elizabeth, N. J., was an exhibition of projects made by the eight different patrols. The display adjudged the best was the work of the "mineral patrol." These scouts made a model of a mining camp, complete in every detail showing various mining methods and equipment. Accompanying the model were labeled mineral specimens such as would be produced in the layout they had displayed.

Mineral collectors have a broad field in which to exercise their ingenuity. Practical and educational exhibits may be prepared to show the interesting and mystifying properties of minerals. One type that always attracts attention and tells a story is a collection classified as "Minerals of Interest." Such a collection shows, for example, how iceland spar reveals two long lines on a sheet of paper when held over a single line, due to its double refracting powers (on the same principle that a stick appears bent when dipped in water). It would show how lodestone violently attracts a compass needle and picks up iron fragments. Of course, the "Virginia Lucky Stone," the mineral which crystallizes in the form of crosses, often perfect St. George's and St. Andrew's, would be included. Mercury, the only liquid metal, which has such a high specific gravity that an iron bar will float in it, is always of interest.

Still other types of collections are those which show the variation in color or weight, or form, or hardness of minerals. Then too, the scout will find he can prepare collections that are based even more closely on the merit badge requirements for mining. These include samples of different ores, types of rock formations, groups of the rock-making minerals and many others.

Malcolm Douglas,
*Boy Scouts of America.*

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One-fourth of all the bird population of South America is in Ecuador.

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English air traffic rules require airplanes to give the right of way to airships and balloons.

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The Crow Indians are among the tallest of people, the men averaging almost six feet in height.

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A new device to suck rock dust out of mines makes the air more healthy for miners to breathe.

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The 110 story skyscraper planned for New York City will have 60 elevators, none of which will make the entire 110 floor trip.

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Automobiles have helped to kill off wild game animals, not by running the animals down, but by carrying hunters more quickly and easily to inaccessible places.

BIOLOGY

## NATURE RAMBLINGS

By Frank Thone

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### Humming-Birds

Humming-birds have been called flying jewels, living bits of flame, and similar fanciful and poetic names by such a variety of naturalists and literary folk that it is vain to seek a new descriptive term for them. Everybody knows them, and exclaims joyously when these little birds condescend to pay them a visit.

The best way to secure regular visits from humming-birds is to plant a trumpet-creeper vine somewhere about the premises. The deep-throated, flame-colored flowers of this tropical plant are the favorite food-counters of these hovering, humming, darting small bits of feathery energy. But they can be lured by other deep or long-spurred flowers that common bees have trouble getting into, for example, the common annual larkspur.

The common feeling that there is something exotic about humming-birds, that they do not exactly fit in with the rest of our birds, is quite correct. The whole family is essentially tropic, and those that visit us during the summer come late and leave early on their flight to warmer lands at the summer's end. In the tropics there are thousands of them to one in the temperate zones, and our few non-tropic species are quite eclipsed by dozens and scores of humming-birds that never leave their warm home-lands.

Some of the tropical humming-birds replace insects in the familiar role of carrying pollen from flower to flower, thus insuring fertilization and a crop of seed. The yellow dust catches on the feathers of their heads, and the next flower they visit receives a bit of it on its stigma. Many of these flowers have given up all dependence on insects as pollenation agents, and rely entirely on their special humming-birds guests.

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# Earth Will Support Eight Billion People

On this page, Dr. Frank Thone gives a few of the high-lights of the First International Congress of Soil Science, which met at Washington, June 13 to 22.

Eight thousand million souls. That is the size of the population the world can sustain, if all of its lands are utilized to the full. So said Dr. Albrecht Penck, noted geographer of the University of Berlin, at the meeting of the First International Congress of Soil Science.

Dr. Penck has surveyed the peoples of the earth and considered the present and potential food-supplying power of the fields they till and yet may win from forest and desert. And he refuses to bow to the ghost of Malthus at any mere two and one-half billions, which is the limit allowed for world population by many of his colleagues.

If this latter estimate is true, he says, our politico-economic problem is indeed acute, for we shall reach the two-and-a-half billion mark within a century. A hundred years ago, when Malthus first expressed his fears of world misery through over-population, and proposed birth restriction to avert it, there were nine hundred million people in the world. The centennial of his gloomy prediction, 1920, saw the world population doubled, with at the same time a marked advance in the standards of living of many races.

The failure of Malthus' prophecy to be realized, Dr. Penck pointed out, has been due partly to the winning of new lands through the clearing of forest areas in the temperate zones, and partly to improved methods of cultivation applied to older lands. If comparable advances can be made in the yet untapped but immense resources of the tropics, the one and three-quarters billions of people now on this planet have only begun to fulfil the ancient injunction to multiply, and replenish the earth, and subdue it. To the objection that the white man can not become acclimated to the moist tropics, Dr. Penck opposes the reply that he has not yet made a really serious, scientific effort to do so, and that if he will descend gradually from his higher, cooler border lands he may yet be able to conquer the jungle and make it into a country he can live in.

But even if the tropics can not be made permanently habitable for the white race, there are other peoples who can fill them if they are properly guided. Dr. Penck pointed out the example of the natives of Java, who under the benevolent despotism of the Dutch rule have increased until now the fifty thousand square miles of the island support a population of thirty-five millions, or nearly seven hundred persons to the square mile. The Javanese have only an Oriental standard of living, it is true; yet the condition of their swarming millions now is better than that of the sparse scores of thousands of their ancestors before the science of the white man showed them how to improve their lot. As a comparison, we may vision the state of Iowa, which is somewhat larger than Java, supporting a quarter of the population of the United States, instead of its present two and one-half millions.

Brazil is to be the great nation of the future, if our grandchildren can make good the dream of Dr. Penck. It depends on whether the lowlands of the Amazon can be settled, he said. The conquest of the tropics, he emphasized in concluding, depends on a close and careful study of all factors affecting human life in them, and especially on an accurate knowledge of their widely various soils.

### Science Has Stabilized Agriculture

Science has changed agriculture from an occupation that in past ages has had to choose between moving on to new and unexhausted fields, and staying at home to starve. This was the keynote of the presidential address of Dr. Jacob G. Lipman. Ancient Rome, he stated, knowing nothing of modern methods of preserving permanent fertility of the soil, literally ate up the fields of Italy, and then ate up Sicily, Sardinia and the lands of the coast of Africa. The medieval world did no better. The Germanic migrations that upset the whole world were due largely to crop failures following uneconomic primitive agriculture. Our own Indians moved frequently, apparently for the same reason. But modern science has shown the way to keep farm lands permanently productive. None the less, he added, we have still to learn to think of soil problems in world terms.

"As students of soils and soil resources we must think not only of plant-food but of its mobilization," he told his hearers. "We must consider the soil solution not alone in its local relations, but as a part of a great mass of fresh water moving to the sea. We must consider the cubic miles of sediment deposited at the outlets of great rivers as a toll upon the land and as a tax upon those who till it. We must think, finally, of ancient plants and animals, as well as of those now living, as possessors of something that in the workshop of creation must be used over and over again. We are the technical advisors to the nations who are trustees of precious raw materials. These must be used wisely and conserved effectively in order that human kind may travel with the least pain and sorrow on its road of destiny."

### Terraces to Check Floods

Flood relief figured in the discussions of the Congress. Not merely stronger and higher levees to keep the Mississippi within bounds, not forests and reservoirs in the headwaters region, should be the only reliances of river control engineers, declared Dr. A. F. Woods, director of scientific work of the U. S. Department of Agriculture. The way the hills are farmed nowadays permits spring rains and melting snows to run straight off their steep sides and into the valleys, swelling the creeks and small rivers and piling the water up at last into disastrous floods. Terraces, he said, are imperative in hillside farming, if repetitions of this spring's tragic events are to be averted.

"Failure to build terraces on sloping fields generally and to plant grass and trees on the steeper lands highly susceptible to rainwash accounts for much of the excess of water now sweeping down the Mississippi," he said. "Practically nothing is being done about this phase of flood prevention. There are no hillside terraces north of the Arkansas River. Eighteen inches of topsoil has been removed from the youthful fields in some parts of northeastern Kansas. The entire topsoil is gone from hundreds of thousands of acres in western Virginia, western Pennsylvania, eastern Kentucky and southeastern Ohio. Not only will terraces and other soil-binding measures slow up the run-off water, but they will save the most valuable part of the soil, and will reduce the clogging of streams, which cuts down their carrying capacity and adds to the flood danger."

(*Just turn the page*)

## Soil Science Congress

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### $CO^2$ in Soil Solution

The breath of bacteria, the carbon dioxide discarded by them as a by-product of their life-processes, comes to man's table as his daily bread. We live on the exhalations of billions of tiny beings which we never see. This, in brief paraphrase, was the revolutionary doctrine laid before the Congress in a paper prepared by Dr. Julius Stoklasa, of the Technical Institute and Experiment Station of Prague.

The old theory that plants build their food out of carbon dioxide which they capture from the air by means of their leaves, Dr. Stoklasa said, is entirely inadequate. The supplies of this gas in the air, according to his measurements, are not sufficient to account for the sugars, starches and other substances formed by plants with the assistance of the sun's energy. But the soil solution contains a great deal of carbon in the form of bicarbonates, and this carbon is taken into the plant along with the other soil minerals used by the plant, and borne by the sap to the green parts where carbohydrate manufacture is going on.

Of course not nearly all of the carbon dioxide given off by soil bacteria gets into the plants. A great deal of it escapes upwards, into the air. But here the leaves are waiting for it, and it passes into the plants through the channels hitherto taught as orthodox according to the accepted doctrines of plant physiology.

Furthermore, according to Prof. Stoklasa, fertilizers added to the soil are by no means entirely for the direct benefit of the corn or clover or other crops. A large share of these plant condiments fall to the share of the bacteria, stimulating them to greater activity in the production of materials eventually used in the production of foods by the higher plants.

### The Usefulness of Fungi

Mushrooms, moulds and other fungi, neglected plants usually regarded as nearly useless or even dangerous, have their place in the complex underground processes that eventually make our farms and forests.

Sir John Russell, director of the great British agricultural experiment station at Rothamstead, told how fungi are being used on horseless farms to make fertilizer out of the otherwise wasted straw. The new "manureless manure" is made simply by adding to straw water and certain chemicals, especially phosphates, ammonia and lime, and letting the fungal spores that float in the air do the rest.

The importance of fungi to trees was stressed by a number of speakers at a special session on the problems of forest soils. Many of our most important timber trees, including pines, spruces, larches and oaks, live in a sort of mutually parasitic union with mushrooms and other kinds of fungi. These fungi receive nourishment from the trees and in turn supply other kinds of food material to the roots. Such fungi are known as "micorrhiza," which means "fungous roots." Micorrhiza thrive best, it was stated, in soils rich in raw humus, while trees in older soils have less of them. They seem to be jealous of their root-inhabiting privileges, for they keep away from their hosts the growths of harmful and wholly parasitic fungi, that would otherwise infest them.

### The Versatility of Peat

Peat, or "turf" as old Irish people call it, is a material whose agricultural and industrial value is not properly appreciated in America, according to Dr. A. P. Dachnowski of the U. S. Department of Agriculture. Dr. Dachnowski showed samples of German-made cloth, woven largely from peat fibers, and sheets of thick, corky material used for heat insulation. He also had with him a vertical section cut from a peat bog, in which there are roots, leaves and the remains of insects and other forms of animal life, dating back ten thousand years or more, yet all perfectly preserved. At one level he pointed out plants that grew when Tut-ankh-amon reigned, at another, leaves that were green when Christ was born.

### Physiological "Missing Links"

Creatures that seem to be a sort of missing link between the world of independently-living green plants that can build their own food out of inorganic material, and the world of dependent plants, including the fungi and bacteria, that must have ready-made organic food to live on, have been studied by Dr. B. Muriel Bristol-Roach of Rothamstead. These between-world soil dwellers belong to the plant group known to botanists as algae, familiar examples of which are the green pond-scums that swarm in stagnant water. Most of these are as completely free-living as corn or cabbage. In the soil-inhabiting group, however, there are some species that can grow in this normal fashion at the surface, but below ground, where the light is cut off, they apparently are able to take hold of dead organic material and feed on it as fungi do, thus hastening its return to the dust from whence it came.

### Poison Stimulates Bacteria

Small amounts of chemical substances in the soil, many of them poisonous to bacteria, seem to have a stimulating effect on these microscopic organisms as well as on the bigger plants whose lives they affect, according to Dr. J. E. Greaves, of the Utah Agricultural Experiment Station. In his studies on the rise and decline of soil bacterial populations he has found this stimulating effect followed the use of arsenic, of sodium sulphate and of sodium chloride, all of which are poisonous to bacteria in stronger concentrations.

The explanation which Dr. Greaves offers for this phenomenon is that the effect of the poison is not a direct one. He inclines to the opinion that there is in the soil, along with the bacteria, a destructive substance or principle allied to the bacteriophage, prominent in recent medical research, and that the poisons cause increases or decreases in its activity, thereby causing the fluctuations in the numbers of bacteria.

### Bacteria Founded Steel Trade

The vast iron mines of Minnesota, of Alsace, of Silesia, and the roaring furnaces of Pittsburgh, of Sheffield, of Essen, all owe their existence to the activities of humble bacteria that swarmed in unimaginable billions in the swamps and pools of long past ages. This vision was conjured up by the paper of Dr. Rudolph Lieske of the great German agricultural and forestry experiment station near Berlin.

According to Dr. Lieske, iron is an essential of life to the bacteria that cover the surfaces of wayside pools with rusty films. "Have you had your iron today?" is neither a jest nor an advertisement to these humble creatures. They get the life energy that keeps them going by changing one kind of iron rust into another. And the slow accumulation of their iron-loaded bodies, piling up through multitudinous leisurely millenia, filled the hollow places of the earth with what we now call iron ore.

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## How to Use Key Words

In order to aid in catching the items that concern you and to facilitate clipping and filing, a key word in small capitals has been printed on the right of the line above each article. The key words used fit into any system of classification, whether it be a straight alphabetical file, a system of your own devising, the Library of Congress classification or the Dewey system.

### Library of Congress Classification

A General Works. Polygraphy.
B Philosophy.
BF Psychology.
G Geography, voyages, travel.
GA Mathematical and astronomical geography.
GB Physical geography.
GC Oceanology and oceanography.
GF Anthropogeography.
GN Anthropology. Somatology. Ethnology. Ethnography. Prehistoric archæology.
GR Folklore.
GT Manners and customs.
GV Sports and amusements. Games.
HC Economic history and conditions. National production.
HD Economic history. Agriculture and Industries.
HE Transportation and communication.
HF Commerce.
HM Sociology. General.
HQ Family. Marriage. Woman.
HV Social pathology.
L Education.
M Music.
N Fine arts.
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Q Science. General.
QA Mathematics.
QB Astronomy.
QC Physics.
QD Chemistry.
QE Geology.
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QL Zoology.
QM Human anatomy.
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QR Bacteriology.
R Medicine. General.
S Agriculture. General.
SB Field crops. Horticulture. Landscape gardening. Pests and plant diseases.
SD Forestry.
SF Animal culture. Veterinary medicine.
SH Fish culture and fisheries.
SK Hunting. Game protection.
T Technology. General.
TA Engineering. General.
TC Hydraulic engineering.
TD Sanitary and municipal engineering.
TE Roads and pavements.
TF Railroads.
TG Bridges and roofs.
TH Building construction.
TJ Mechanical engineering.
TK Electrical engineering and industries.
TL Motor vehicles. Cycles. Aeronautics.
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TT Trades.
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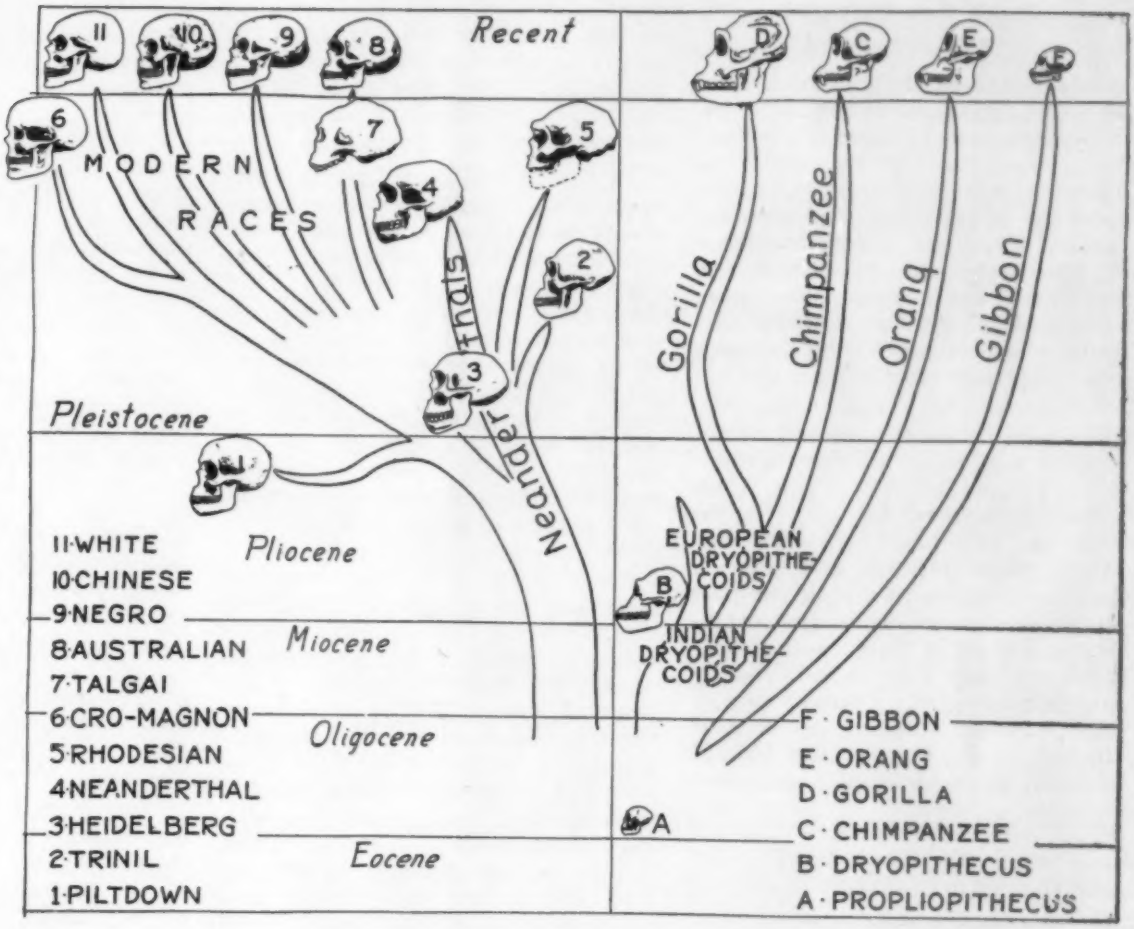
U Military science. General.
V Naval science. General.

### Dewey Classification

000 GENERAL WORKS—
010 Bibliography
020 Library economy
030 General cyclopedias
040 General collected essays
050 General periodicals
060 General societies
070 Newspapers
080 Special libraries. Polygraphy.
090 Book rarities
100 PHILOSOPHY—
110 Metaphysics
120 Special metaphysical topics
130 Mind and body
140 Philosophical systems
150 Mental faculties. Psychology
160 Logic
170 Ethics
180 Ancient philosophers
190 Modern philosophers
200 RELIGION—
210 Natural theology
220 Bible
230 Doctrinal. Dogmatics. Theology
240 Devotional. Practical
250 Homiletic. Pastoral. Parochial
260 Church. Institutions. Work
270 Religious history
280 Christian churches and sects
290 Ethnic. Non-Christian
300 SOCIOLOGY—
310 Statistics
320 Political science
330 Political economy
340 Law
350 Administration
360 Associations. Institutions
370 Education
380 Commerce. Communication
390 Customs. Costumes. Folklore
400 PHILOLOGY—
410 Comparative
420 English
430 German
440 French
450 Italian
460 Spanish
470 Latin
480 Greek
490 Minor Languages
500 NATURAL SCIENCE—
510 Mathematics
520 Astronomy
530 Physics
540 Chemistry
550 Geology
560 Paleontology
570 Biology
580 Botany
590 Zoology
600 USEFUL ARTS—
610 Medicine
620 Engineering
630 Agriculture
640 Domestic economy
650 Communication. Commerce
660 Chemical technology
670 Manufactures
680 Mechanic trades
690 Building
700 FINE ARTS—
710 Landscape gardening
720 Architecture
730 Sculpture
740 Drawing. Decoration. Design
750 Painting
760 Engraving
770 Photography
780 Music
790 Amusement
800 LITERATURE—
810 American
820 English
830 German
840 French
850 Italian
860 Spanish
870 Latin
880 Greek
890 Minor languages
900 HISTORY—
910 Geography and travels
920 Biography
930 Ancient history
Modern
940 Europe
950 Asia
960 Africa
970 North America
980 South America
990 Oceania and polar regions




*THE FAMILY TREES of men and the apes according to Prof. Osborn. The Oligocene era in which he believes man had his roots ended some 19,000,000 years ago. Dr. Gregory, Prof. Osborn's associate, holds that man and the apes rose from the same stock only about 7,000,000 years ago, and he believes that Dryopithecus, assigned to the ape line by Prof. Osborn, was one of man's ancestors.*

### Man's Age Extended

(*Continued from page 398*)

Piltdown man, a time sufficient in his opinion for primitive man to assume the characteristics which distinguish him from the apes.

That Asia is the place to look for the ancestor of man is the belief of both Prof. Osborn and Dr. Gregory. There on the open plains of that continent, now the home of the yellow race and one of the most inaccessible parts of the globe, the Dawn Men lived and grew, and became men because of the hard life that they lived. Existence on the open plains was more hazardous and exciting than in the forests to the south, where the ape cousins of the dawn men were living a life of comparatively little exertion. The dawn men had to use their gray matter, and brains, like muscles, grow when used. The human race, still at its best in the temperate zones, has the hardships of the Asiatic plains to thank for its large heads, progressive actions and mental superiority to the best of the animal world.

### Asia Early Home

So convinced have Prof. Osborn and other members of the American Museum of Natural History been of the existence of the dawn men in Asia that the elaborate and ambitious expeditions into Asia's past that have been made under the leadership of Roy Chapman Andrews have been particularly instructed to be on the lookout for traces of the ancestors of modern man. And the American Museum scientists have not been unsuccessful, for they brought back flint implements and other cultural remains from different localities in Mongolia and China. These, however, are assigned to the Stone Age, a period in human evolution that is much more recent than the time of the dawn men.

But out of China, land of mystery, there have come dragon's bones. The yellow men use ground-up fossil bones as medicine. Over twenty years ago an eminent German paleontologist purchased in a Pekin drugstore a fossil tooth that he declared was probably that of an ancient man. That incident was recalled when last fall there came from Asia the news that Dr. J. G. Andersson of the Geological Survey of China and Dr. O. Zdansky of the University of Upsala had found evidences of the dawn man in Asia. Imbedded in geologic deposits with the bones of various mammals they found two teeth which experts declare are essentially human. The strata of the earth in which these teeth were found are believed to have been laid down in the Upper Pliocene age some million to three million years ago. Before such antiquity, the ancient temples of China appear as new as the shacks of a boom town.

In Europe remains of ancient man have been found with considerable frequency. Whole and perfectly preserved skeletons of Neanderthal men have been unearthed at various localities. In the caves of southern France and Spain there have been found the earthly remains of the artistic Cro-Magnons, that skillful race that most anthropologists believe to have been in direct ancestral line of modern man. Long before these early men there must have lived in England some sort of human race, for among Pliocene strata along the coast of Sussex there are found worked flints considered to be of human manufacture.

To the Old World, therefore, the birthplace of man has been assigned. The most generally accepted location

(*Just turn the page*)

### Man's Age Extended

(*Continued from page* 403)

of the human cradle is in Asia, from whence man roamed to Europe, Africa, and the various island of the East.

For the New World anthropologists have in the past held out little assurance of man any older than the Indians, who some twenty-five thousand years ago came from Asia; and yet there have been reported from various localities in America discoveries which may bring America into the picture of man's past.

Is it possible, then, that the dawn men of Asia, hardened to adventure and eager for new experiences, crossed to America as their Indian successors did many thousands of years later? In Oklahoma Texas, New Mexico and Florida there have appeared during the past few years other evidences that primitive man lived in America at a vastly earlier time than is believed by most scientific men. Two scientists of the Colorado Museum of Natural History, J. D. Figgins and Harold J. Cook, have obtained from three localities arrowheads in close association with extinct animals. At one place along the Lone Wolf Creek near the town of Colorado, Texas, flood waters exposed the bones of extinct species of bison, and as this nearly complete skeleton was being unearthed, three arrowheads, totally unlike like those of any known collection, were found beneath it.

In a sand and gravel pit at Frederick, Okla., primitive grinding instruments as well as arrowheads were found in strata of such antiquity that they are assigned to the Great Ice Age when prehistoric elephants and mastodons roamed the land. Real estate booms have not been the only product of Florida in past years, for from the drainage ditches of realtors at Melbourne and Vero on the east coast of central Florida, a Smithsonian Institution expedition unearthed a skull and stone arrowheads in close association with the bones and teeth of mammoths, mastodons and other prehistoric animals. Such recent discoveries recall less authenticated and earlier reports of evidences of ancient man in America. The charcoal evidence of a prehistoric fire was unearthed several years ago beneath a mastodon in New York state and an arrowhead was reported discovered in close association with an extinct bison in Kansas. Thus, it may be that America as well as Asia and Europe will play its part in the pushing back through millions of years the antiquity of man.

### Earth's Age Greater

While the new discoveries of human and pro-human teeth and artifacts have been instrumental in increasing man's antiquity, the great expansion in geological ideas of the earth's antiquity have played their part. A few years ago the entire age of the earth was reckoned at less than a hundred million years. The most widely accepted estimates of the earth's age were based on the rate at which the great river systems of the world are carrying the silt and soil of the land that they drain and laying it down as deposits along the shores of the continents. The geologists assumed that the sedimentary rocks of the earth's crust formed in the same way were laid down at the same rate as those those now in the making. But then, new investigations and discoveries indicated that rocks today are being formed much faster than they were in ancient eras.

The astronomers, too, demanded a longer time for the age of the earth since such a short life as one hundred million years did not fit in with the facts of the rest of the universe. So the radioactive minerals containing uranium, thorium and radium were hit upon as time clocks of the earth. Scientists found that no matter how the radioactive minerals were treated, no matter how they were compressed, or heated, or cooled, they went on disintegrating at precisely the same rate. They assumed that they had been disintegrating at the same rate so long as the earth has existed. And then, cleverly, by measuring the quantities of the disintegration products of these radioactive minerals in the crust of the earth they arrived at an estimate of the age of the various rocks of the earth. The late Prof. Joseph Barrell of Yale, using his radium chronometer, estimated that the oldest Precambrian rocks, the original crust of the earth, were molten 1,400,000,000 years ago. The Tertiary period, that interval in the earth's history that immediately precedes the time in which we live, was assigned a scant three million years in the earlier estimates of the earth's age, whereas Professor Barrell set down its duration as about sixty million years.

The human race therefore has grown more venerable due to these increases in the estimates of the age of the earth. But the new discoveries in Asia, Europe and America will also undoubtedly play their part in making us realize what an ancient institution the human race is.

Contemplating the lowly estate from which the human race has risen and the vast expanses of time during its evolution, modern man from his pinnacle overlooking the rest of the animal kingdom may hopefully predict the future.

Science News-Letter, June 25, 1927

## Anniversaries of Science

**June 29, 1895**—Thomas Henry Huxley, naturalist and protagonist of Darwin's theory of evolution, died.

But if I may speak of the objects I have had more or less definitely in view since I began the ascent of my hillock, they are briefly these: To promote the increase of natural knowledge and to forward the application of scientific methods of investigation to all the problems of life to the best of my ability, in the conviction which has grown with my growth and strengthened with my strength, that there is no alleviation for the sufferings of mankind except veracity of thought and of action, and the resolute facing of the world as it is when the garment of make-believe by which pious hands have hidden its uglier features is stripped off.

It is with this intent that I have subordinated any reasonable, or unreasonable, ambition for scientific fame which I may have permitted myself to entertain to other ends, to the popularization of science; to the development and organization of scientific education; to the endless series of battles and skirmishes over evolution; and to untiring opposition to that ecclesiastical spirit, that clericalism, which in England, as everywhere else, and to whatever denomination it may belong, is the deadly enemy of science.

—Huxley: *Autobiography.*

Science News-Letter, June 25, 1927

**July 1, 1811**—Publication by Avogadro of a paper in which he first used the word "molecule" and in which he showed that many elementary molecules contain more than one atom marked an advance in theoretical chemistry.

M. Gay-Lussac has shown in an interesting Memoir . . . . that gases always unite in a very simple proportion by volume, and that when the result of the union is a gas, its volume also is very simply related to those of its components. But the quantitative proportions of substances in compounds seem only to depend on the relative number of molecules which combine, and on the number of composite molecules which result. It must then be admitted that very simple relations also exist between the volumes of gaseous substances and the numbers of simple or compound molecules which form them. The first hypothesis to present itself in this connection, and apparently even the only admissible one, is the supposition that the number of integral molecules in any gas is always the same for equal volumes, or always proportional to the volumes. Indeed, if we were to suppose that the number of molecules contained in a given volume were different for different gases, it would scarcely be possible to conceive that the law regulating the distance of molecules could give in all cases as simple as those which the facts just detailed compel us to acknowledge between the volume and the number of molecules.

—Avogadro: *Essay on a Manner of Determining the Relative Masses of the Elementary Molecules of Bodies and the Proportions in which they Enter into these Compounds.*

Science News-Letter, June 25, 1927

**July 2, 1897**—The patent for the Wireless Telegraph was granted to Marconi in England.

*Wireless Telegraphy*, or telegraphing without any wires at all, from one point to another through space, is the most modern and startling development in telegraphy. To the average mind this is highly suggestive of scientific imposition, so intangible and unknown are the physical forces by which it is rendered possible, and yet this is one of the late achievements of the Nineteenth Century. . . . .

In March, 1899, Signor Guglielmo Marconi, an Italian student, then residing in England, successfully communicated between South Foreland, County of Kent, and Boulogne-sur-Mer, in France, a distance of thirty-two miles across the English Channel . . . . The Marconi system of wireless telegraphy was practically employed with useful effect April 29, 1899, on the "Goodwin Sands" light-ship to telegraph for assistance when in collision twelve miles from land and in danger of sinking. It was also used in October, 1899, on board the "Grande Duchesse" to report the international yacht race between the "Columbia" and the "Shamrock" at Sandy Hook. Lord Roberts also made good use of it in his South African campaign against the Boers. According to Signor Marconi its present range is limited to eighty-six miles, but it is expected that this will be soon extended to 150 miles.

Byrn: *Progress of Invention in the Nineteenth Century* (1900).

Science News-Letter, June 25, 1927

ASTRONOMY

## Will See Eclipse From Air

For the first time in history an astronomer will observe a total eclipse of the sun from his own airplane. Gerald Merton, F. R. A. S., will fly over England to see and photograph the eclipse of June 29. Merton was a pilot in the Royal Air force during the war. He recently bought an airplane of his own for scientific use. With him will be Maj. P. H. Hepburn, F. R. A. S., war aviator and formerly president of the British Astronomical Association.

Another attempt to photograph the eclipse from the air, and so to rise above the clouds that may prevent terrestrial observations, will be made by two astronomers from the Royal Observatory at Greenwich, William M. H. Greaves, chief assistant, and William W. Witchell, head of the Observatory's Magnetic and Meteorological Branch. They will fly in a Handley-Page air liner provided by a London newspaper. At first, it was stated they had agreed to make the trip merely for the fun of it, but that now they expect to secure good observations.

With the large machine they have chosen, they hope that difficulties from vibration will be minimized, and the pilot thinks that he will be able to keep the machine pointed at the sun.

Science News-Letter, June 25, 1927

## First Glances at New Books

AN INTRODUCTION TO BIOLOGY—Alfred C. Kinsey—*Lippincott's.* This book is designed for use as a high school text, but it is ambitious in its range of topics. It includes not only the customary sections on classification, structure and functions of plants and animals and a discussion of hygiene, but also branches out into distribution and ecology, and especially into considerations of the relations between the various organisms and man. It is also an excellent example of the reaction that seems to be following the epidemic of timid deletions, by text-book writers, following the anti-evolution outbreak. More space than ever is devoted to evolution, and the treatment of this topic is one of the best-thought-out in the whole work. And whether it was deliberate or only a "happenstance," the prominence given in this section to the work of the monk Mendel can hardly do otherwise than make Fundamentalist inquisitors squirm.

Science News-Letter, June 25, 1927

THE SEVEN SEALS OF SCIENCE—Joseph Mayer—*Century* ($3.50). An outline of the history and achievements of mathematics, astronomy, physics, chemistry, biology, geology and psychology, showing their relations to each other and to other fields of knowledge. "Social studies," he says, "if they are to be worthy of the name of science, must build upon the natural sciences and particularly upon geology, biology and psychology."

Science News-Letter, June 25, 1927

SCIENCE OF TODAY — Sir Oliver Lodge—*Harper* ($1). A brief and readable account of modern atomic physics by an author who contributed much to the development of its early stages.

Science News-Letter, June 25, 1927

THE WAR ON MODERN SCIENCE—Maynard Shipley—*Knopf* ($3). A review of the warfare of the Fundamentalists against the teachings of science. Data from all parts of the United States are presented, and the situation presented as it stood at the close of the year 1926.

Science News-Letter, June 25, 1927

NEW CONCEPTIONS IN COLLOIDAL CHEMISTRY — Herbert Freundlich — *Dutton* ($2). An authoritative account of some of the modern concepts in the chemistry of colloids.

Science News-Letter, June 25, 1927